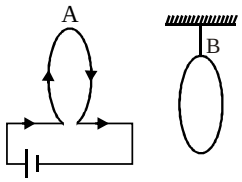
IIT PHYSICS CENTRE

BY D.B. Singh

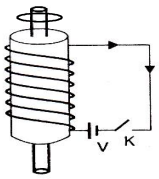
2-Ka-35, Vigyan Nagar, Kota. Phone No. (0744) 2428962, 977288 1234, 98285 35802
E-mail : dbsiit@gmail.com

1. A system S consists of two coils A and B. The coil A have a steady current I while the coil B is suspended near by as shown in figure. Now the system is heated so as to raise the temperature of two coils steadily, then :

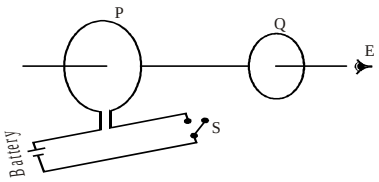


(A) The two coils show attraction
(B) The two coils show repulsion
(C) There is no change in the position of the two coils
(D) Induced currents are not possible in coil B

2. A conducting ring is placed around the core of an eletromagnetas shown in figure. When key K is pressed, the ring:
(A) Remain stationary
(B) Is attracted towards the eletromagnet
(C) Jumps out the core
(D) None.

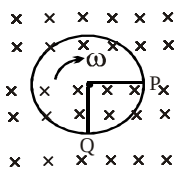


3. As shown in figure P and Q are two coaxial conducting loops separated by some distance. When the switch S is closed, a clockwise current I_p flows in P (as seen by E) and a induced current I_{Q1} flows in Q. The switch remains closed for a long time. When S is opened, a current I_{Q2} flows in Q. Then the direction I_{Q1} and I_{Q2} (as seen by E) are :



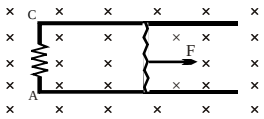
(A) Respectively clockwise and anti-clockwise
(B) Both clockwise **(C)** Both anti-clockwise
(D) Respectively anti-clockwise and clockwise

4. A conducting ring of radius r is rolling without sliping with a constant angular velocity μ . If the magnetic field strength is B and is directed into the page then emf induced across PQ is:



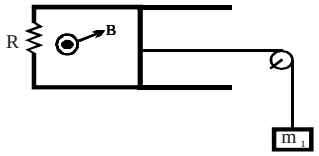
(A) $B\mu r^2$ **(B)** $\frac{B\mu r^2}{2}$ **(C)** $4B\mu r^2$ **(D)** $\frac{®^2 r^2 B\mu}{8}$

5. Two long parallel conducting horizontal frictionless and resistanceless rails are connected by a resistor of resistance R (shown in the figure). The distance AC is equal to l. A uniform magnetic field B acts vertically downward in the region. An irregular shape of wire is placed over the rails. The force required to maintain a uniform velocity V_0 of the irregular wire is :



(A) Zero **(B)** $\frac{B^2\ell^2 v_0}{R}$
(C) No sufficient information **(D)** None.

6. A rod of length l, negligible resistance and mass m slides on two horizontal frictionless rails of negligible resistance by hanging a block of mass m_1 by the help of insulating massless string passing through fixed massless pulley (as shown). If a constant magnetic field B acts upwards perpendicular to the plane of the figure, the steady state velocity of hanging mass is :



(A) $\frac{m_1 gR}{B^2\ell^2}$ upward **(B)** $\frac{m_1 gR}{B^2\ell^2}$ downward
(C) $\frac{m_1 gR}{B^2\ell^2}$ upward **(D)** $\frac{m_1 gR}{B^2\ell}$ downward

7. A conductor of length l and mass m can slide along a pair of vertical metal guides connected by a resistor R. A uniform magnetic field of strength B normal to the plane of page is directed outwards. The steady speed of fall of rod is :

(A) $\frac{mgR}{B^2\ell^2}$ **(B)** $\frac{mg}{B^2\ell^2 R}$
(C) $\frac{B^2\ell^2}{mgR}$ **(D)** $\frac{mgB}{\ell^2 R}$